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USE OF SOIL AMENDMENTS TO IMPROVE PHYSICAL PROPERTIES OF SOIL

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Soils should be in good condition, both physically and chemically, to provide for good growth of plants. Many soils are unsuited for this purpose and should be amended to improve these properties. Soil amendments are the materials added to the soil for the purpose of improving their physical and chemical properties to make them more suitable for plant production.

Physical Properties

The physical properties of soil are: texture—size distribution of soil particles, structure—arrangement of the soil particles into aggregates of varying sizes and shapes, porosity—the amount and size of the non-solid portion (pores) of the soil, permeability—rate of water movement into and through the soil, water-holding capacity—amount of water retained in the soil after drainage, and weight of the soil. The most important of these is texture and structure as they affect all the other physical properties and have a strong influence upon the chemical properties as well.

Why Improve Physical Properties?

Good plant growth depends upon the proper air-water relationships in the soil. The water should move into and through the soil rapidly so the soil is not saturated with water for any length of time. Plant growth and yield may be reduced by 50 percent for each 24 hours the soil is saturated with water, except in crops like taro and rice. Some plants, such as papaya, will die if the soil is saturated for 24 hours. By improving the physical properties of soils the drainage is improved and this problem is reduced.

The soil should retain an adequate amount of available water after drainage. This will reduce the danger of drought and the need for frequent irrigation to meet plant needs, thereby reducing labor and water costs for plant production.

Plant roots should be unrestricted in their growth. Hard compact soils, those with hard pans, rocks,

buried construction-materials, etc. will restrict plant growth. So will those that are too wet or too dry. Unrestricted root growth increase the effectiveness of plant nutrients and water in the soil. This reduces the need for fertilizers and reduces the frequency of watering in that soil.

Soils should be light enough to provide ease in mechanical operations but heavy enough to provide adequate plant support. Light soils are those which have low power requirements and are easily manipulated. These are generally in better physical condition than are the heavy soils. Light soils are the sands and loams. Heavy soils are those high in clay. Those soils that crack when dry and swell are very sticky when wet, are the heavy soils. They should be avoided whenever possible.

How To Improve Physical Properties

The most effective way to alter and improve soil physical condition is to till it. Once good tilth is obtained it should be kept that way as long as possible. This can be done by keeping traffic to a minimum to avoid compaction, not wetting the soil surface with a heavy spray to avoid crust formation, and by not allowing the soil to dry out.

The physical properties may also be improved by adding soil amendments. This will improve soil texture and structure which improves all the other physical properties of the soil.

What Amendments To Use

If good soil is available, one part soil, one part organic matter and one part sand or cinders makes an excellent mixture. If the soil is sand, use same proportions but mix one part top soil or clay in place of the sand or cinders. Never mix the heavy sticky clays in these soils. For lawns, mix to depth of four to six inches, for vegetables, eight to ten inches, for trees and shrubs, to depth of two to three feet and in an area of two to three feet in diameter. These are then mixed uniformly to produce the desired properties. Mixing may be done

by removing the entire volume of soil, adding the necessary amounts of amendments, mix thoroughly in a cement mixer then replacing, putting in pots or containers, etc. Often this is too much work and requires too much time. Mixing may be accomplished by placing the amendments to the soil surface and mixing in with a spade, spading fork, rototiller or similar tools. For best results it is essential that mixing be uniform and to the depth necessary for the particular plant to be grown.

Organic matter may be added by use of animal manures, compost, peat moss, sawdust, bagasse or similar materials. The white or coral sands should not be mixed with the soil as they are calcium carbonate and eventually will dissolve. This results in a condition worse than if it had not been used at all. Black, green or red sands are the most effective. If white silica sand (imported, as there is none in Hawaii) is available it, too, is satisfactory. Cinders, less than 1/8 inch in size, should be used; larger ones will cause excessive drainage and be obstructive in soil management operations. Black, red or gray cinders are satisfactory.

When using animal manures as a source of organic matter, wait two weeks or more before placing

plants in the mixture. When using sawdust, bagasse or similar high carbon-low nitrogen materials, mix one cup of ammonium sulfate or its equivalent per bushel of material added (or about 30 pounds of nitrogen per ton of material added) to the soil. This will reduce the danger of nitrogen deficiency for plants grown in the peat moss or similar materials, extra nitrogen and a waiting period is unnecessary.

Fertilizer, at the recommended rate, for plant growth may be added and mixed in when preparing mixtures. This allows the necessary plant nutrients to be distributed throughout the soil providing an excellent environment for root development, and reduces the number of operations and labor required.

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